Cambridge International AS Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary Level

MATHEMATICS **9709/22**

Paper 2 Pure Mathematics 2 **(P2)** **October/November 2015**

1 hour 15 minutes

4080482503

Additional Materials: Answer Booklet/Paper
Graph Paper
List of Formulae (MF9)

READ THESE INSTRUCTIONS FIRST

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.
Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an electronic calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 50.
Questions carrying smaller numbers of marks are printed earlier in the paper, and questions carrying larger numbers of marks later in the paper.

This document consists of **3** printed pages and **1** blank page.

1 **(i)** Solve the equation $|3x - 2| = 5$. [3]

(ii) Hence, using logarithms, solve the equation $|3 \times 5^y - 2| = 5$, giving the answer correct to 3 significant figures. [2]

2 The sequence of values given by the iterative formula

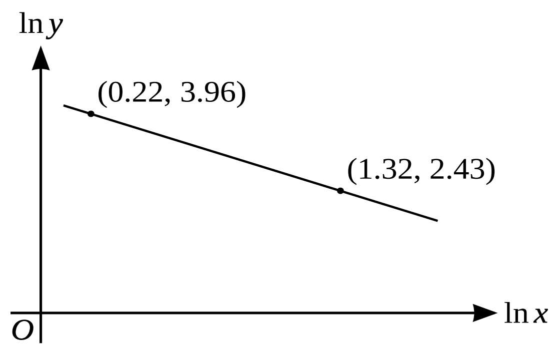
$$x_{n+1} = 2 + \frac{4}{x_n^2 + 2x_n + 4},$$

with initial value $x_1 = 2$, converges to α.

(i) Determine the value of α correct to 3 decimal places, giving the result of each iteration to 5 decimal places. [3]

(ii) State an equation satisfied by α and hence find the exact value of α. [2]

3



The variables x and y satisfy the equation $y = Kx^m$, where K and m are constants. The graph of $\ln y$ against $\ln x$ is a straight line passing through the points (0.22, 3.96) and (1.32, 2.43), as shown in the diagram. Find the values of K and m correct to 2 significant figures. [6]

4 The polynomial $p(x)$ is defined by

$$p(x) = 6x^3 + 11x^2 + ax + a,$$

where a is a constant. It is given that $(x + 2)$ is a factor of $p(x)$.

(i) Use the factor theorem to show that $a = -4$. [2]

(ii) When $a = -4$,

(a) factorise $p(x)$ completely, [3]

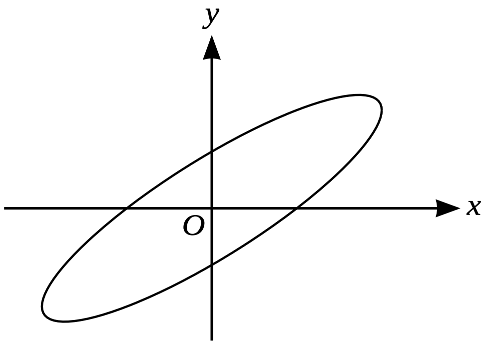
(b) solve the equation $6\sec^3\theta + 11\sec^2\theta + a\sec\theta + a = 0$ for $0° \leqslant \theta \leqslant 180°$. [2]

5 Find the x-coordinates of the stationary points of the following curves:

(i) $y = 4xe^{-3x}$; [3]

(ii) $y = \dfrac{4x^2}{x + 1}$. [5]

6



The diagram shows the curve with parametric equations

$$x = 3\cos t, \qquad y = 2\cos(t - \tfrac{1}{6}\pi),$$

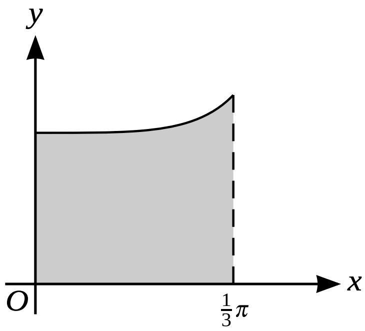
for $0 \leqslant t < 2\pi$.

(i) Show that $\dfrac{dy}{dx} = \frac{1}{3}(\sqrt{3} - \cot t)$. [5]

(ii) Find the equation of the tangent to the curve at the point where the curve crosses the positive y-axis. Give the answer in the form $y = mx + c$. [4]

7 **(i)** Show that the exact value of $\displaystyle\int_0^{\frac{1}{3}\pi} \left(\cos^2 x + \frac{1}{\cos^2 x}\right) dx$ is $\frac{1}{6}\pi + \frac{9}{8}\sqrt{3}$. [6]

(ii)



The diagram shows the curve $y = \cos x + \dfrac{1}{\cos x}$ for $0 \leqslant x \leqslant \frac{1}{3}\pi$. The shaded region is bounded by the curve and the lines $x = 0$, $x = \frac{1}{3}\pi$ and $y = 0$. Find the exact volume of the solid obtained when the shaded region is rotated completely about the x-axis. [4]

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